App. Serial No.: 09/935,403
Atty. Docket No.: 0011-046

REMARKS

These remarks are in response to the Office Action dated April 23, 2004, which has a shortened statutory period for response set to expire July 23, 2004. No extension of time is required.

Drawings

The drawings are objected to under 37 CFR § 1.83(a). The Examiner writes:

> The drawings must show every feature of the invention specified in the claims. Therefore, the recited feature "the vias are uniformly distributed on both an X axis and a Y axis of the LCD array" of claim 21 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

As amended herein, Claim 21 recites in part "the vias of each imaging surface are arranged in a group; the groups of vias are evenly spaced along an X direction of the LCD array; and the groups of vias are evenly spaced along a Y direction of the LCD array." Support for amendment is provided in FIG. 4. Because the drawings show all of the limitations of amended Claim 21, Applicant requests reconsideration and withdrawal of the drawing objections under 37 CFR § 1.83(a).

Specification

The specification is amended to provide a basis for defining different types of displays. The amendment is intended to be definitional in nature, and no new matter is added. In particular, an arbitrary value of 25% via area / pixel mirror area is selected so as to be able to clearly define between displays wherein scattering is desirable and displays (like those of the present invention) where scattering is not desirable. Support for this amendment is provided in FIGs. 2-4, and in Applicant's original specification in the paragraph beginning at Page 7, Line 26, which makes clear that the physical distortion caused by the vias is a problem. No new matter is added.

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Claims

Claims 1-31 are pending in the above-identified application. Claims 1-31 are rejected over prior art. Claims 1, 9, 11, 21-22, and 24-31 are amended and Claims 32-47 are added. Claims 5-8, 10, 12-13, and 15-20 were previously amended, Claim 23 was previously added, and Claims 2-4 and 14 remain as filed. Reconsideration is requested.

Rejections Under 35 U.S.C. § 112

Claims 30 is rejected under 35 U.S.C. § 112, second paragraph. The Examiner writes:

> In claim 30, line 4, the recited feature "the first insulating layer" lacks antecedent basis.

As amended herein, Claim 30 recites in part "wherein each of the vias passes through the insulating layer...." Antecedent basis for "the insulating layer" is provided in line 5 of Claim 30. Therefore, Applicant respectfully requests reconsideration and withdrawal of the rejection of Claim 30 under 35 U.S.C. § 112.

Claim 30 is also amended to correct a minor grammatical error. In particular, the word "pass" is changed "passes."

For the above reasons Applicants request reconsideration and withdrawal of the rejections under 35 U.S.C. § 112.

Summary of Examiner Interview

A telephone interview was held between Examiner Tai V. Duong and Applicant's attorney Larry E. Henneman, Jr., on July 21, 2004. During the interview U.S. Patent Application Publication 2001/0013913 (Young) and U.S. Patent Application Publication 2003/0085404 (Kim et al.) were discussed. In particular, Applicant pointed out that Applicant's invention is directed to high-definition displays used in projector systems and the like, while Young was directed to "direct-view" type displays, for example, those used in laptop computer screens and cell phone displays. With respect to Kim et al., Applicant pointed out that Kim et al. was directed to transmissive displays (e.g., TFT on glass), while Applicant's invention is directed toward reflective displays. The Examiner seemed very knowledgeable in the display art and readily recognized the distinctions pointed out by Applicant between Applicant's invention and the prior art.

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At least three distinguishing features of Applicant's invention were discussed, as described in more detail below. The Examiner agreed that claim language directed to these features could be effective to distinguish over the prior art of record. The Examiner did not, however, commit to any particular allowable language, indicating that he might require time to further consider the proposed language in view of the prior art of record, and to perform an updated search. The three distinguishing features discussed are as follows.

I. Surface Area Coverage of Vias Over Pixel Mirror

Young teaches a directly viewable reflective liquid crystal display device having a plurality of vias formed under each pixel mirror. A primary goal of Young is to increase the light scattering effect of the pixel cells by incorporating a large amount of vias into the surface of each pixel. Young indicates that 50% or more of the surface area of a pixel cell should be covered by vias. For example, paragraph 0009 of Young suggests:

> Preferably, the plurality of contact openings are arranged regularly over a substantial part of the pixel electrode area, for example in a generally uniform row and column array occupying 50% or more of the overall area of the pixel electrode.

Young echoes this point in paragraph 0031, providing:

> Typically, there will be a few tens of opening per pixel distributed over a substantial proportion, greater than around 50%, of the overall pixel area.

The primary benefits of Young's invention are described in paragraph 0030 which provides:

> The plurality of tapering contact openings 47 distributed over the pixel area result in the reflective pixel electrode 45 having reflective depressions 50 at these opening locations which serve to enhance the light scattering characteristics of the pixel electrode, for example, to ensure that light is reflected towards a viewer in a direction generally normal to the plane of the substrate 11 so as to produce a display output of adequately high luminance, bearing in mind that light can be incident on the reflective pixel electrodes from various angles. The intensity of light reflected perpendicular and near perpendicular to the substrate 11 is thus increased, resulting in a bright display output and improved display quality. The improved scattering characteristics can also be beneficial to increasing the viewing angle.

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In contrast, the present invention is designed to minimize the perceptible effects of distortion caused by via formation in the mirrors of a reflective LCD array. Accordingly, several particular via layouts are described in Applicant's specification and are shown in FIGs. 2-4 of the original disclosure. In each of these embodiments, the number of vias per mirror (e.g., two) is minimal compared to the amount of vias employed by Young (e.g., 29).

In fact, providing an excess of vias would be detrimental to the LCD arrays of Applicant's invention in several ways. First, because the LCD arrays of Applicant's invention are directed to reflective video imaging devices, such as projectors, wherein high display resolution is critical, excessive light scattering would result in reduced quality of the reflected image. Second, projectors are designed with well defined optical paths. For example, an image beam modulated and reflected off an LCD array in a projector must travel along a very confined path to the projection optics. Light scattered off of the optical path is either lost from the system or focused at an improper location of the projected image, thereby reducing both the brightness and quality of the image.

Therefore, it is not an object of Applicant's invention to provide enough vias per pixel cell that the surface area occupied by the vias would even approach 50% of the pixel area. In fact, Applicant would anticipate that the vias of the present invention would not approach 25% of the pixel's surface area.

For the above reasons, Applicant asserts that although both Applicant's invention and Young disclose the use of a plurality of vias per pixel mirror, the respective displays of Applicant's invention and Young's are very different. Applicant's invention is directed to high brightness, high resolution reflective LCD arrays used in projection systems where scattering is very undesirable. Conversely, Young is directed to direct view type displays wherein a large number of "bumps" are intentionally formed on each pixel mirror in order to scatter incident light to increase the amount of light reflected toward a viewer and to increase viewing angle. Indeed, the display of Young would be unsuitable for use in a high resolution projection system.

Selecting an arbitrary percent of via area per pixel mirror area which is much lower than is indicated to be desirable by Young and is much higher than is desirable in the displays of Applicant' invention (i.e., 25%) provides a clear means of distinguishing between the two types of displays.

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II. All Vias Arranged on a Single Line

Each of FIGs. 2-4 show exemplary layouts of vias according to Applicant's invention, wherein all of the vias of each pixel mirror are arranged along a single line. In addition, the vias are symmetric about a perpendicular bisector of the line on which they lie. In contrast, Young does not disclose such an element. Instead, the vias of Young are arranged either in a regular or irregular array, as shown in FIGs. 2 and 3A-3G.

The Examiner indicated his preference for this feature of Applicant's invention as a distinction over Young.

III. Reflective LCD Array

The LCD array of Applicant's invention is a reflective LCD array. The LCD array of Kim et al. is a transmissive LCD array (e.g., TFT on glass). For example, at paragraph 0051, Kim et al teach that "the pixel electrode 82 is made of a transparent conductive material such as indium tin oxide (ITO)." Applicant believes that limiting the claims of the present invention to reflective imaging surfaces will obviate the rejections over Kim et al. The Examiner agreed.

Rejections Under 35 U.S.C. § 102

Claims 1-3, 5-12, 14-23, and 25-31 are rejected under 35 U.S.C. § 102 (e) as being anticipated by Young (Pub. No.: US 2001/0013913).

Applicant respectfully requests reconsideration in view of the amendments made herein.

The standard for anticipation is set forth in M.P.E.P. § 2131 as follows:

> "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." Verdegaal Bros. v. Union Oil Co. of California, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ... claim." Richardson v. Suzuki Motor Co., 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

As amended herein, Claims 1, 9, 11, 21, 22, and 25-31 now recite the limitation "the vias of each imaging surface occupy no more than 25% of the surface area of the imaging surface." For the reasons provided above in the Interview Summary, Applicant respectfully asserts that Young does not disclose this element of Claims 1, 9, 11, 21, 22, and 25-31. In fact, Young clearly teaches away from such a limitation, such that there would not even be a suggestion to so

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modify the device of Young. Therefore, Applicant respectfully asserts that Claims 1, 9, 11, 21, 22, and 25-31 distinguish over the cited prior art.

Claims 2-3, 6-8, 10, 12, 14-20, and 23 depend either directly or indirectly from one of Claims 1, 9, 11, and 22, and are therefore distinguished from the cited prior art for at least the reason provided above with respect to Claims 1, 9, 11, and 22.

Claims 1, 4, 11, 13, and 24 are rejected under 35 U.S.C. § 102 (e) as being anticipated by Kim et al. (Pub. No.: US 2003/0085404).

Applicant respectfully requests reconsideration in view of the amendments made herein.

As amended herein, Claims 1, 11, and 24 recite (in part) "a plurality of reflective imaging surfaces." Accordingly, these claims are now clearly directed to reflective displays. As stated above in the Interview Summary, Kim et al. teaches a transmissive LCD array, while Applicant's invention is directed to reflective LCD arrays. Therefore, because Kim et al. does not teach every element of Claims 1, 11, and 24, Kim et al. does not anticipate Claims 1, 11, and 24.

Claims 4 and 13 depend directly from Claims 1 and 11, respectively, and are therefore distinguished from the cited prior art for at least the reason provided above with respect to Claims 1 and 11.

For the above reasons Applicant requests reconsideration and withdrawal of all the rejections under 35 U.S.C. § 102.

New Claims

Claims 32-34

Claims 32-34 recite that all of the vias of each imaging surface (or mirror) "lie on a line" and the vias are arranged "symmetric about an axis perpendicularly bisecting the line." Therefore, for the reasons given above in the Interview Summary, Applicant believes that Claims 32-34 distinguish over the cited prior art. In addition, Claims 32-34 each depend from Claims 1, 9, and 11, respectively, and are also distinguished from the cited prior art for at least the reasons provided above with respect to those base claims.

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Claims 35-37

Claims 35-37 each include the limitation "the vias of each imaging surface [mirror] occupy no more than 5% of the surface area of the imaging surface [mirror]." Therefore, for the reasons given above in the Interview Summary, Applicant believes that Claims 35-37 distinguish over the cited prior art. In addition, Claims 35-37 each depend from Claims 1, 9, and 11, respectively, and are also distinguished from the cited prior art for at least the reasons provided above with respect to those base claims.

Claims 38-40

Claims 38-40 each include the limitation "the LCD array is suitable for use in a video projection system." Therefore, for the reasons given above in the Interview Summary, Applicant believes that Claims 38-40 distinguish over the cited prior art. In addition, Claims 38-40 each depend from Claims 1, 9, and 11, respectively, and are distinguished from the cited prior art for at least the reasons provided above with respect to those base claims.

Claim 41

Claim 41 combines the subject matter disclosed in Claims 1 and 4 prior to this amendment. Claim 41 includes the limitation "reflective imaging surfaces," and therefore should distinguish over Kim et al. for the reasons provided above.

Claims 42-47

Each of Claims 42-46 depend from one of Claims 1, 9, and 11, and recite via placement based on the pitch of the display. Applicant respectfully asserts that Claims 42-47 distinguish over Young and Kim et al., because neither cited reference teaches the limitations recited by Claims 42-47. In addition, because Claims 42-47 each depend from one of Claims 1, 9, and 11, Claims 42-47 are each distinguished from the cited prior art for at least the reasons provided above with respect to those base claims.

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Request For Constructive Assistance

Applicant would like to thank the Examiner for his suggestions and recommendations during the telephone interview. As stated above, Applicant believes that this application discloses patentable subject matter, that the pending claims are directed to that subject matter, and that the pending claims distinguish over the prior art of record. However, Applicant also recognizes that the patentable subject matter of the present application is somewhat challenging to claim in a way that gives Applicant the scope of protection to which he is entitled. Therefore, should the Examiner disagree that the pending claims are allowable, Applicant invites the Examiner to suggest language which would distinguish Applicant's invention over the prior art of record.

For the foregoing reasons, Applicant believes Claims 1-47 are in condition for allowance. Should the Examiner undertake any action other than allowance of Claims 1-47, or if the Examiner has any questions or suggestions for expediting the prosecution of this application, the Examiner is requested to contact Applicant's attorney at (269) 279-8820.

Respectfully submitted,

Date: 7/23/04

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CERTIFICATE OF FACSIMILE TRANSMISSION (37 CFR 1.8(a))

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being transmitted via facsimile, on the date shown below, to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, at (703) 872-9306.

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